

## WHAT IS CLAIMED IS

1           1.   (amended)

2           A polishing medium for chemical-mechanical polishing,  
3 comprising:

4           an oxidizing agent for a conductor; a  
5 protective-film-forming agent for protecting a metal  
6 surface; an acid; and water,

7           not comprising abrasive grains, wherein:

8           said polishing medium has a pH of 3 or less, and

9           said oxidizing agent is in a concentration of from  
10 0.01% by weight to 3% by weight.

1           2.   (Amended)

2           The polishing medium for chemical-mechanical  
3 polishing, comprising:

4           an oxidizing agent for a conductor; a  
5 protective-film-forming agent for protecting a metal  
6 surface; an acid; water; and abrasive grains;

7           said abrasive grains are colloidal silica or  
8 colloidal alumina,

9           said abrasive grains have a pH of 3 or less; and  
10 said an oxidizing agent is in a concentration of from  
11 0.01% by weight to 3% by weight.

1           3. The polishing medium for chemical-mechanical  
2 polishing according to claim 2, wherein:  
3           said abrasive grains have a average particle diameter  
4 of 50 nm or less, and  
5           said abrasive grains have standard deviation of  
6 particle size distribution in a value of more than 5  
7 nm.

1           4. (Canceled)

1           5. (Canceled)

1           6. (Canceled)

1           7. (Canceled)

1           8. (Amended)

2           The polishing medium for chemical-mechanical  
3 polishing according to claim 2, wherein said abrasive  
4 grains are mixed in an amount of from 0.1% by weight  
5 to 5% by weight.

1           9. (Amended)

2           The polishing medium for chemical-mechanical

3 polishing according to any one of claims 1 to 3 and 8,  
4 which further comprises a water-soluble polymer.

1 10. The polishing medium for chemical-mechanical  
2 polishing according to claim 9, wherein said water-soluble  
3 polymer is at least one selected from the group consisting  
4 of polyacrylic acid, a polyacrylic acid salt,  
5 polymethacrylic acid, a polymethacrylic acid salt,  
6 polyamic acid, a polyamic acid salt, polyacrylamide,  
7 polyvinyl alcohol and polyvinylpyrrolidone.

1 11. The polishing medium for chemical-mechanical  
2 polishing according to claim 9 or 10, wherein said  
3 oxidizing agent is in a concentration of from 0.01% by  
4 weight to 1.5% by weight.

1 12. (Amended)

2 The polishing medium for chemical-mechanical  
3 polishing according to any one of claims 1 to 3 and 8  
4 to 11, wherein said acid is an organic acid.

1 13. The polishing medium for chemical-mechanical  
2 polishing according to claim 12, wherein said acid is  
3 at least one selected from malonic acid, malic acid,

4 tartaric acid, glycolic acid and citric acid.

1 14. (Amended)

2 The polishing medium for chemical-mechanical  
3 polishing according to any one of claims 1 to 3 and 8  
4 to 13, wherein said protective-film-forming agent is  
5 at least one selected from benzotriazole and a derivative  
6 thereof.

1 15. (Amended)

2 The polishing medium for chemical-mechanical  
3 polishing according to any one of claims 1 to 3 and 8  
4 to 14, wherein said oxidizing agent for a conductor is  
5 at least one selected from hydrogen peroxide, nitric  
6 acid, potassium periodate, hypochlorous acid and ozone  
7 water.

1 16. (Amended)

2 The polishing medium for chemical-mechanical  
3 polishing according to any one of claims 1 to 3 and 8  
4 to 15, wherein said conductor contains at least one of  
5 copper, a copper alloy, a copper oxide and a copper alloy  
6 oxide.

1           17. (Amended)

2           The polishing medium for chemical-mechanical  
3 polishing according to any one of claims 1 to 3 and 8  
4 to 15, wherein said conductor is a barrier layer for  
5 preventing copper atoms from diffusing.

1           18. The polishing medium for chemical-mechanical  
2 polishing according to claim 17, wherein said barrier  
3 layer contains tantalum, a tantalum alloy or a tantalum  
4 compound.

1           19. (Amended)

2           As polishing condition, polishing pressure is 25  
3 kPa and relative speed of substrate member to polishing  
4 platen is 18 m/minute, a polishing medium for  
5 chemical-mechanical polishing having:

6           a polishing-rate ratio (Ta/Cu) between tantalum and  
7 copper or a copper alloy of more than 1;

8           a polishing-rate ratio (Ta<sub>2</sub>N<sub>3</sub>/Cu) between tantalum  
9 nitride and copper or a copper alloy of more than 1;  
10          a polishing-rate ratio (Ta/SiO<sub>2</sub>) between tantalum  
11 and silicon dioxide of more than 10; and

12          a polishing-rate ratio (Ta<sub>2</sub>N<sub>3</sub>/SiO<sub>2</sub>) between tantalum  
13 nitride and silicon dioxide film of more than 10.

1           20.   (Amended)

2           As polishing condition, polishing pressure is 25  
3   kPa and relative speed of substrate member to polishing  
4   platen is 18 m/minute, the polishing medium for  
5   chemical-mechanical polishing according to any one of  
6   claims 1 to 3 and 8 to 18, which has:

7           a polishing-rate ratio (Ta/Cu) between tantalum and  
8   copper or a copper alloy of more than 1;

9           a polishing-rate ratio (Ta<sub>2</sub>N<sub>5</sub>/Cu) between tantalum  
10   nitride and copper or a copper alloy of more than 1;

11          a polishing-rate ratio (Ta/SiO<sub>2</sub>) between tantalum  
12   and silicon dioxide of more than 10; and

13          a polishing-rate ratio (Ta<sub>2</sub>N<sub>5</sub>/SiO<sub>2</sub>) between tantalum  
14   nitride and silicon dioxide film of more than 10.

1           21.   (Amended)

2           A method of polishing a substrate member comprising  
3   a step of polishing a barrier layer containing tantalum,  
4   a tantalum alloy or a tantalum compound, by the use of  
5   the polishing medium for chemical-mechanical polishing  
6   according to any one of claims 1 to 3 and 8 to 19.

1           22.   (Amended)

2           A method of polishing a substrate member comprising

3 a step of polishing a surface including a wiring layer  
4 and a barrier layer, by the use of the polishing medium  
5 for chemical-mechanical polishing according to any one  
6 of claims 1 to 3 and 8 to 19.

## WHAT IS CLAIMED IS

1           1. A polishing medium for chemical-mechanical  
2 polishing, comprising:

3           an oxidizing agent for a conductor; a  
4 protective-film-forming agent for protecting a metal  
5 surface; an acid; and water, wherein:

6           said polishing medium has a pH of 3 or less, and

7           said oxidizing agent is in a concentration of from  
8 0.01% by weight to 3% by weight.

1           2. The polishing medium for chemical-mechanical  
2 polishing according to claim 1, which further comprises  
3 abrasive grains.

1           3. The polishing medium for chemical-mechanical  
2 polishing according to claim 2, wherein:

3           said abrasive grains have a average particle diameter  
4 of 50 nm or less, and

5           said abrasive grains have standard deviation of  
6 particle size distribution in a value of more than 5  
7 nm.

1           4. (Canceled)



1           5.   (Canceled)

1           6.   The polishing medium for chemical-mechanical  
2   polishing according to any one of claims 2 to 5, wherein;  
3           said abrasive grains are at least one selected from  
4   silica, alumina, ceria, titania, zirconia and germania.

1           7.   The polishing medium for chemical-mechanical  
2   polishing according to claim 6, wherein said abrasive  
3   grains are colloidal silica or colloidal alumina.

1           8.   The polishing medium for chemical-mechanical  
2   polishing according to any one of claims 2 to 7, wherein  
3   said abrasive grains are mixed in an amount of from 0.1%  
4   by weight to 5% by weight.

1           9.   The polishing medium for chemical-mechanical  
2   polishing according to any one of claims 1 to 8, which  
3   further comprises a water-soluble polymer.

1           10.  The polishing medium for chemical-mechanical  
2   polishing according to claim 9, wherein said water-soluble  
3   polymer is at least one selected from the group consisting  
4   of polyacrylic acid, a polyacrylic acid salt,

5 polymethacrylic acid, a polymethacrylic acid salt,  
6 polyamic acid, a polyamic acid salt, polyacrylamide,  
7 polyvinyl alcohol and polyvinylpyrrolidone.

1 11. The polishing medium for chemical-mechanical  
2 polishing according to claim 9 or 10, wherein said  
3 oxidizing agent is in a concentration of from 0.01% by  
4 weight to 1.5% by weight.

1 12. The polishing medium for chemical-mechanical  
2 polishing according to any one of claims 1 to 11, wherein  
3 said acid is an organic acid.

1 13. The polishing medium for chemical-mechanical  
2 polishing according to claim 12, wherein said acid is  
3 at least one selected from malonic acid, malic acid,  
4 tartaric acid, glycolic acid and citric acid.

1 14. The polishing medium for chemical-mechanical  
2 polishing according to any one of claims 1 to 13, wherein  
3 said protective-film-forming agent is at least one  
4 selected from benzotriazole and a derivative thereof.

1 15. The polishing medium for chemical-mechanical

2 polishing according to any one of claims 1 to 14, wherein  
3 said oxidizing agent for a conductor is at least one  
4 selected from hydrogen peroxide, nitric acid, potassium  
5 periodate, hypochlorous acid and ozone water.

1 16. The polishing medium for chemical-mechanical  
2 polishing according to any one of claims 1 to 15, wherein  
3 said conductor contains at lest one of copper, a copper  
4 alloy, a copper oxide and a copper alloy oxide.

1 17. The polishing medium for chemical-mechanical  
2 polishing according to any one of claims 1 to 15, wherein  
3 said conductor is a barrier layer for preventing copper  
4 atoms from diffusing.

1 18. The polishing medium for chemical-mechanical  
2 polishing according to claim 17, wherein said barrier  
3 layer contains tantalum, a tantalum alloy or a tantalum  
4 compound.

1 19. A polishing medium for chemical-mechanical  
2 polishing having:

3 a polishing-rate ratio (Ta/Cu) between tantalum and  
4 copper or a copper alloy of more than 1;

5           a polishing-rate ratio (TaN/Cu) between tantalum  
6   nitride and copper or a copper alloy of more than 1;  
7           a polishing-rate ratio (Ta/SiO<sub>2</sub>) between tantalum  
8   and silicon dioxide of more than 10; and  
9           a polishing-rate ratio (TaN/SiO<sub>2</sub>) between tantalum  
10   nitride and silicon dioxide film of more than 10.

1           20. The polishing medium for chemical-mechanical  
2   polishing according to any one of claims 1 to 18, which  
3   has:

4           a polishing-rate ratio (Ta/Cu) between tantalum and  
5   copper or a copper alloy of more than 1;  
6           a polishing-rate ratio (TaN/Cu) between tantalum  
7   nitride and copper or a copper alloy of more than 1;  
8           a polishing-rate ratio (Ta/SiO<sub>2</sub>) between tantalum  
9   and silicon dioxide of more than 10; and  
10           a polishing-rate ratio (TaN/SiO<sub>2</sub>) between tantalum  
11   nitride and silicon dioxide film of more than 10.

1           21. A method of polishing a substrate member  
2   comprising a step of polishing a barrier layer containing  
3   tantalum, a tantalum alloy or a tantalum compound, by  
4   the use of the polishing medium for chemical-mechanical  
5   polishing according to any one of claims 1 to 19.

1           22. A method of polishing a substrate member  
2   comprising a step of polishing a surface including a  
3   wiring layer and a barrier layer, by the use of the polishing  
4   medium for chemical-mechanical polishing according to  
5   any one of claims 1 to 19.

## Amendment under Article 34

Applicant made the Amendments under PCT Article 34 as follows, which was filed on August 10, 2001.

## In the Specification

1. Page 29, line 15, amend "250 gf/cm<sup>2</sup>." to "25 kPa/ cm<sup>2</sup> (250 gf/cm<sup>2</sup>)".

## In the Claims

2. Page 36, claim 1, line 5, add "not comprising abrasive gains," after "and water,".
3. Page 36, claim 2, amend "The polishing medium for chemical-mechanical polishing according to claim 1, which further comprises abrasive grains." to "The polishing medium for chemical-mechanical polishing, comprising: an oxidizing agent for a conductor; a protective-film-forming agent for protecting a metal surface; an acid; water; and abrasive grains; said abrasive grains are colloidal silica or colloidal alumina, said abrasive grains have a pH of 3 or less; and said an oxidizing agent is in a concentration of from 0.01% by weight to 3% by weight. ".
4. Please cancel Claim 6 and 7.
5. Page 38, claim 8, line 2, amend "according to any one of claims 2 to 7 " to "according to claim 2".
6. Page 38, claim 9, line 2, amend "according to any one of claims 1 to 8" to "according to any one of claims 1 to 3 and 8".
7. Page 39, claim 12, line 2, amend "according to any one of claims 1 to 11" to "according to any one of claims 1 to 3 and 8 to 11".
8. Page 39, claim 14, line 2, amend "according to any one of claims 1 to 13" to "according to any one of claims 1 to 3 and 8 to 13".
9. Page 39, claim 15, line 2, amend "according to any one of claims 1 to 14" to "according to any one of claims 1 to 3 and 8 to 14".
10. Page 39, claim 16, line 2, amend "according to any one of claims 1 to 15" to "according to any one of claims 1

to 3 and 8 to 15".

11. Page 40, claim 17, line 2, amend "according to any one of claims 1 to 15" to "according to any one of claims 1 to 3 and 8 to 15".
12. Page 40, claim 19, line 1, add "As polishing condition, polishing pressure is 25 kPa and relative speed of substrate member to polishing platen is 18 m/minute," before "A polishing medium for chemical-mechanical polishing having:...".
13. Page 40, claim 20, line 1, add "As polishing condition, polishing pressure is 25 kPa and relative speed of substrate member to polishing platen is 18 m/minute," before "A polishing medium for chemical-mechanical polishing according ...".
14. Page 40, claim 20, line 2, amend "according to any one of claims 1 to 18" to "according to any one of claims 1 to 3 and 8 to 18".
15. Page 41, claim 21, line 5, amend "according to any one of claims 1 to 19" to "according to any one of claims 1 to 3 and 8 to 19".
16. Page 41, claim 22, line 5, amend "according to any one of claims 1 to 19" to "according to any one of claims 1 to 3 and 8 to 19".